PATENT
TH0681N (US)
DFH:EM

IN THE UNITED STATES PATENT AND TRADEMARK OFFICE
BEFORE THE BOARD OF APPEALS AND INTERFERENCES

In re application of	)	
	)	
DAVID M. SINGLETON, LOUIS KRAVETZ, BRENDAN D. MURRAY	)	
	)	
Serial No. 09/655,964	)	Group Art Unit: 1796
	)	
Filed September 6, 2000	)	Examiner: Necholus Ogden Jr.
	)	
HIGHLY BRANCHED PRIMARY ALCOHOL COMPOSITIONS, AND BIODEGRADABLE DETERGENTS MADE THEREFROM	)	February 25, 2008

COMMISSIONER FOR PATENTS
P. O. Box 1450
Alexandria, VA 22313-1450

Sir:

APPEAL BRIEF

The Appellants hereby file this appeal brief in response to the final rejection of October 9, 2007 of claims 1-4, 6-8, 12, 70, 72, 73, 75-77, and 79-109.

Real Party in Interest

The real party in interest is Shell Oil Company.

Related Appeals and Interferences

There are no related appeals or interferences but there is a divisional application, Serial No. 11/748,976, which has been rejected by the Examiner in this case.

Status of the Claims

Claims 1-12 were originally filed in this continuation application. Claims 70-83 were added in the Preliminary Amendment of September 6, 2000. Claims 1 and 4 were amended and claim 84 was added in the response of June 12, 2002. In the response of March 7, 2003, claims 1, 12, 70 and 75 were amended, claims 11 and 74 were canceled and new claims 85-102 were added. The final form of the claims is as presented in the response of July 16, 2007 in which claims 1, 6, 70, 77, 85 and 94 were amended, claims 9-10, 74, 76, 80, 90-91 and 99-100 were canceled, and claims 103-109 were added.

Status of Amendments

No amendments have been filed subsequent to the final rejection.

Summary of Claimed Subject Matter

Claim 1 describes a biodegradable sulfate composition comprising sulfates of an alkyl branched primary alcohol composition having an average chain length per molecule of 14 to 19 carbon atoms, an average number of branches per molecule of 0.7 to 2.3, less than 0.5 atom % of quaternary carbon atoms, at least 40 percent methyl branches, 5 to 30 percent ethyl branches and 5 to 25 percent of the number of branches are on the C_2 atoms of the composition. The sulfate composition is described at page 4, lines 14-20, of the specification. The average chain length per molecule of 14 to 19 carbon atoms is described at page 8, lines 19 and 20 of the specification and in Table III on page 34. The average number of branches per molecule of 0.7 to 2.3 is described at page 4, line 19 and page 5, line 7 of the specification. The less than 0.5 atom % of quaternary carbon atoms is described at page 9, lines 8-16, of the specification. The at least 40 percent of the branches being methyl branches is described at page 10, lines 25-27, of the specification. The range of 5 to 30 percent ethyl branches is described at page 10, lines 3-5, of the specification and page 11, lines 2-4. The range of 5 to 25 percent of branching on the C_2 atom is described at page 9, lines 28-30, through page 10, lines 1-2, of the specification.

Claim 70 focuses on a primary branched alcohol composition which is as described in claim 1 except that the average number of branches per molecule is 0.7 to 2.1. The 0.7 to 2.1 range is described at page 8, lines 25-28, of the specification.

Claim 77 focuses on a branched primary alcohol composition as described in claim 1 except that from 10 to 50 percent of the branches are located at the C_3 position relative to the hydroxyl carbon atom. The 10 to 50 percent range is described at page 10, lines 3-7, of the specification.

Claim 85 describes a sulfate composition of an alkyl branched primary alcohol having an average chain length per molecule of 14 to 17 carbon atoms, wherein the rest of the limitations are as described above. The 14 to 17 carbon atom range is described in Table III on page 34 of the specification.

Claim 94 describes a branched primary alcohol composition as described above with respect to claim 85. The locations of the descriptions of the claim limitations of claim 94 are as described above.

Grounds of Rejection to be Reviewed on Appeal

The first ground of rejection to be reviewed upon this appeal is whether or not all of the claims presented upon appeal are obvious under Section 103(a) as being unpatentable over WO 91/10409.

The second ground of rejection to be reviewed upon this appeal is whether or not all of the claims presented herein are obvious under Section 103(a) in view of WO 85/02175.

Argument

WO 91/16409

The Examiner asserts that the claims are obvious in view of WO '409 because it teaches that the commercially available sulfate, Lial 125, is biodegradable and branched. The Examiner's position that in view of this and in absence of showing to the contrary, one of ordinary skill in the art would reasonably construe the sulfates of the reference to encompass the claimed sulfates. The Applicants submitted with the response of November 1, 2006 a first Declaration Under Rule 132 which contained data showing that a similar Lial product gave a much lower multisebum detergency than the branched fraction of a Neodol 45 alcohol sulfate. The Examiner held that the first Declaration "is not commensurate in scope with the claimed invention." The Examiner further

stated that "Applicant claims a broad class of alkyl sulfate/ethoxy sulfate surfactants such as biodegradable sulfate" as described in claim 1, Applicant's most comprehensive claim but "the Declaration compares a very narrow and specific branched fraction Neodol 45 alkyl sulfate with the prior art alkyl sulfate." It is the Examiner's position that one of ordinary skill in the art would not have been able to determine the criticality of the showing in view of the Applicant's first Declaration not being commensurate in scope to the claimed invention.

The Applicants submitted with the response of July 16, 2007 a second Declaration Under Rule 132 from William Warren Schmidt to prove that the invention as claimed in the amended claims is nonobvious. This declaration describes experiments which were carried out with a Neodol 45 sulfate and sulfates of a C_{14} branched alcohol and two different C_{14-15} branched alcohols. All of the alcohols were prepared by skeletal isomerization of the described internal olefins according to the procedure described in Example 5 of the present application. Two of the sulfates had a branching index of 0.92 and 0.94 and the third had a branching index of 1.03. All have methyl branching, ethyl branching, and branching at the C_2 position with the scope of the amended claims.

The multisebum detergency was determined for the Neodol 45 sulfate and the branched alcohol sulfates according to the procedure described in the present application. The experiments described in the first Rule 132 Declaration and in this application were carried out more than 10 years ago. A slightly different multisebum soil has been obtained since that time. In general, it has been determined that this multisebum soil results in a slightly lower detergency level than the old multisebum soil used in the experiments described in the first Rule 132 Declaration and in this application.

It can be seen that the multisebum detergency for the Neodol 45 sulfate was determined to be 10.6. The detergencies for the branched C_{14} and the two branched C_{14-15} alcohol sulfates were determined to be 25.1, 27.9 and 26.3. These results cannot directly be compared with the results from the first Rule 132 Declaration and the examples in the present application because of the difference in the multisebum soil and because the level of surfactant used in the present experiments was higher--0.4 grams per liter. The least significant difference at 95 confidence level is about 2 for these experiments. As discussed below, the Applicants believe that this data shows

that there is a significant difference in the detergencies of the branched alcohol sulfates within the scope of the claims of the present invention and the prior art composition.

The data shown in the first Declaration clearly proves that a branched alcohol sulfate provided a considerably higher multisebum detergency than the Neodol 45 alcohol sulfate it was compared against (35.5 versus 15.8). The detergency of the Lial 145 alcohol sulfate was only slightly better than that of the Neodol 45 alcohol sulfate (18.5 versus 15.8). The data in the experiments provided in the second Rule 132 Declaration shows that sulfates of branched alcohols within the scope of the claims of the present invention give much better multisebum detergencies than the Neodol 45 alcohol sulfate. Thus, it is reasonable to conclude that the branched alcohol sulfates of the present invention give a much better detergency than Lial 145 alcohol sulfate. Since that material is very similar to the product described in WO '409, it is reasonable to conclude that sulfates of branched alcohols within the scope of the amended claims would likewise give superior detergencies than the product described in WO '409.

The Applicants assert that the data provided in the two Rule 132 Declarations and provided in the specification itself provide a sufficient showing that branched alcohol sulfates within the scope of the claims, as amended, of the present invention give an unexpectedly higher level of multisebum detergency than products such as disclosed in the WO '409 reference. For this reason, the Applicants assert that the Declarations overcome the rejection based on this reference.

The Examiner has held that the first Rule 132 Declaration is insufficient to overcome the rejection because it is not commensurate in scope with the claimed invention. However, the Examiner does not provide any comment on the second Rule 132 Declaration. The Applicants assert that the Declarations taken together with the data in the application is quite extensive espcially in light of the difficulty and expense in making these different materials. The claims have been amended and do not encompass a "broad class of alkyl sulfate/alkoxy sulfate surfactants." Between the data in the examples and that in the two declarations, alcohols with carbon numbers throughout the claimed range (a range of only 6 carbon numbers, only 4 in some claims) have been provided and evaluated. Alcohols with different branching indexes have been evaluated as well.

The Examiner has also maintained a rejection based on WO '175. This reference is said to disclose a detergent composition wherein the compositions comprise C_{14} alcohols having branching at the 2- position and an additional methyl branch. The Examiner admits that the reference lacks the present specific teaching of branches per molecule but concludes that it would have been obvious to one of ordinary skill in the art to expect similar characteristics and properties from the sulfated alcohols of the reference and that "absence a showing to the contrary," that a prima facie case of obviousness was made.

The Applicants assert that the data presented in the second Rule 132 Declaration and the first Rule 132 Declaration provide "a showing to the contrary" and show that the compositions claimed in the amended claims do provide a significant unexpected advantage over prior art compositions such as those described in WO '175.

The record reflects that the Examiner's primary argument for making the present rejections is the assertion by the Examiner that WO '175 discloses a C_{14} alcohol that is structurally similar to the presently claimed compositions. Applicants respectfully submit that the Examiner's "structural similarity" rationale cannot support prima facie obviousness rejections of the present claims over WO '175. First, the branching at the 2-position contains five carbons and is not methyl and ethyl within the scope of the amended claims (see p. 8).

Before discussing the inapplicability of the "structural similarity" obviousness rationale in the present application, Applicants note that even assuming arguendo that this "structural similarity" obviousness analysis is appropriate and further assuming arguendo that WO '175 discloses, as asserted by the Examiner, an isomer of the presently claimed compositions, these assumed facts would not automatically be conclusive proof of prima facie obviousness. MPEP 2144.09 states:

> **HOMOLOGY AND ISOMERISM ARE FACTS WHICH MUST BE CONSIDERED WITH ALL OTHER RELEVANT FACTS IN DETERMINING OBVIOUSNESS**
>
> Compounds which are position isomers (compounds having the same radicals in physically different positions on the same nucleus) or homologs (compounds differing regularly by the successive addition of the same chemical group, e.g., by $-CH_2-$ groups) are generally of sufficiently close structural similarity that

there is a presumed expectation that such compounds possess similar properties. . . .

Isomers having the same empirical formula but different structures are not necessarily considered equivalent by chemists skilled in the art and therefore are not necessarily suggestive of each other. *Ex parte Mowry*, 91 USPQ 219 (Bd. App. 1950) (claimed cyclohexylstyrene not *prima facie* obvious over prior art isohexylstyrene). Similarly, homologs which are far removed from adjacent homologs may not be expected to have similar properties. *In re Mills*, 281 F.2d 218, 126 USPQ 513 (CCPA 1960) (prior art disclosure of C_8 to C_{12} alkyl sulfates was not sufficient to render *prima facie* obvious claimed C_1 alkyl sulfate).

Homology and isomerism involve close structural similarity which must be considered with all other relevant facts in determining the issue of obviousness. . . . Homology should not be automatically equated with *prima facie* obviousness because the claimed invention and the prior art must each be viewed "as a whole." . . . (emphasis added).

Applicants first note that the compound of WO '175 and the claimed compositions are not, as the Examiner seems to suggest, position isomers as defined above in the quote from MPEP 2144.09 because position isomers according to MPEP 2144.09 are "compounds having the same radicals in physically different positions on the same nucleus." As discussed in detail below, such similarities do not exist in the present case. More importantly, based on MPEP 2144.09, if it is assumed arguendo that a "structural similarity" obviousness analysis is appropriate in the present case and if it is further assumed arguendo that WO '175 discloses, as asserted by the Examiner, an isomer of the presently claimed compounds, the assumed isomerism would be only one factor out of many factors to be considered in the determination of obviousness. The Examiner still must consider an invention as a whole. Therefore, the Examiner must consider all of the limitations of the present claims (for example, limitations relating to branching) and must not simply ignore all of the limitations not disclosed by WO '175. Applicants respectfully submit that a bare assertion that one isomer renders all other isomers obvious is inappropriate.

No Prima Facie Case for Obviousness has Been Established

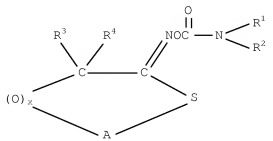
As previously mentioned, Applicants respectfully assert that the Examiner's "structural similarity" arguments cannot support prima facie obviousness rejections of the present claims

over WO '175. Applicants submit that the "structural similarity" obviousness analysis is applicable only in situations wherein prior art discloses structures that are very close to claimed structures. Applicants point out that the title of MPEP 2144.09 is "**Close** Structural Similarity Between Chemical Compounds (Homologs, Analogues, Isomers)" (emphasis added) and that the first statements within that section are as follows:

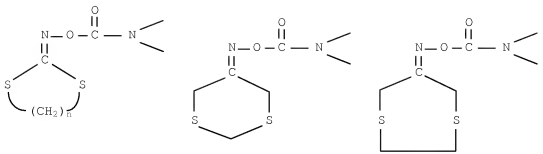
> **REJECTION BASED ON CLOSE STRUCTURAL SIMILARITY IS FOUNDED ON THE EXPECTATION THAT COMPOUNDS SIMILAR IN STRUCTURE WILL HAVE SIMILAR PROPERTIES**
> A *prima facie* case of obviousness may be made when chemical compounds have very close structural similarities and similar utilities (emphasis added).

To illustrate the Applicants' position on the meaning of "very close structural similarity," without commenting on the correctness or currency of other holdings or discussions therein, Applicants refer to the cases cited by the Examiner in rejecting the present claims based on structural similarity: In re Payne, 606 F.2d 303, 203 USPQ 245(CCPA 1979); In re Papesch, 315 F.2d 381, 137 USPQ 43 (CCPA 1963); In re Dillon, 919 F.2d 688, 16 USPQ2d 1897 (Fed. Cir. 1991). In each of these cases, specific molecular structures (individual molecule graphically illustrated, specifically named, or represented by formula, etc.) capable of bond-by-bond and atom-by-atom comparison were present both in the claims and in the prior art upon which "close structural similarity" obviousness rejections were based.

For example, in In re Payne, 606 F.2d 303, 203 USPQ 245 (CCPA 1979), claim 1 recited the structural formula:



"Structural similarity" obviousness rejections under appeal had been based upon prior art disclosing the following structures:



In all of the cases cited by the Examiner in support of the Examiner's structural obviousness rejections, the distinct structural similarities and differences between the prior art in those cases and the claims of those cases were clearly and readily capable of visualization, characterization, and enumeration. Applicants assert that the "structural similarity" obviousness analysis is most readily applicable in these types of situations where both prior art and claims show specific molecular structures (individual molecule graphically illustrated, specifically named, or represented by formula, etc.). Bond-by-bond and atom-by-atom comparisons inherently conducted in such situations make it possible to determine whether molecular structural similarities are extremely numerous and molecular structural differences are very insignificant, such as where the types of molecular structural differences present are well-known to tend to have no significant effect upon molecular properties. In instances of extremely numerous structural similarities coupled with very insignificant differences, it might be said that one of ordinary skill in the art would be motivated to arrive at claimed compounds by making insignificant modifications to known prior art compounds, retaining in the modified compounds most of the structural features of the original known compounds. The motivation to make the insignificant modifications while retaining most other structural features is based upon the desire to create modified compounds having the same properties as the original known prior art compounds. One of ordinary skill in the art would expect the properties of insignificantly modified compounds to be the same as properties of the known prior art compounds if the structural similarities between the modified and known compounds are numerous enough.

This reasoning is based on numerous molecular structural similarities coupled with very insignificant molecular structural differences. If these factors are present, very insignificant differences can be ignored, under appropriate circumstances, as obvious modifications. Absent sufficiently numerous specifically identifiable similarities or in the presence of differences that

are not insignificant, Applicants contend that the differences should not be ignored. The "structural similarity" obviousness analysis should be reserved for situations involving very close structural similarities (MPEP 2144.09), and in all other instances the Examiner must point to teachings or suggestions of each and every limitation of the claims.

In asserting obviousness in the present application, the Examiner has made and relied upon general assertions of "structural similarity," but the Examiner has not pointed to very close and numerous structural similarities between the presently claimed compositions and compositions of WO '175. The general assertion of structural similarity made by the Examiner is limited to "because they are the same compounds but different isomers" (no showing of why this is so) certainly cannot be said to rise to the level of numerous structural similarities typically observed when known and claimed specific molecular structures (individual molecule graphically illustrated, specifically named, or represented by formula, etc.) have been compared in a bond-by-bond and atom-by-atom fashion and found to be obvious variants of each other. Furthermore, the differences between compositions of WO '175 and the present claims, which differences have been ignored by the Examiner, are not insignificant. The Examiner has ignored limitations of the present claims which are not well-known in the art to have little effect on properties.

The branched alcohols described in the reference are all 2-alkyl branched compounds. They have to be by virtue of the description in the application on pages 4 through 7 and also by the description of the process for making these materials, for example, at page 23. See also Table 3 on page 38 wherein all of the isomers shown are 2-alkyl branched alcohols.

Furthermore, the branches which extend from the 2 position on the chain must also be higher alkyl chains than just methyl or ethyl. The description of these alcohols shown on page 6 requires that the branch have 5 carbon atoms. This is the primary product of the invention of the reference. Claim 1 describes the branch as having from 3 to 6 carbon atoms. Obviously, this is not methyl or ethyl.

Evidence Appendix C is a report of additional experiments that were carried out and submitted to the PCT Examiner in 1998. 2-alkyl branched alcohols having 14, 15, and 16 carbon atoms were made with methyl, ethyl, propyl, butyl, or hexyl branches. Sulfates of these materials were made and tested according to the procedure described to determine multisebum soil

removal and triolein soil removal. All of the experiments which can be compared directly show that better results in terms of soil removal are achieved with methyl or ethyl groups than can be achieved with propyl, butyl, or hexyl groups.

This data shows that "very close structural similarity" does not exist in this case since the reference describes 100 percent 2-alkyl branching with long chains and the present invention describes mostly shorter chain branching wherein only 5 to 25% of the branches are at the 2 position. This means that compositions of the present invention cannot have 100 percent branching at the C_2 position.

The reference does not describe materials such as those that are claimed in the present application and thus it cannot suggest that improved soil removal could be achieved by modifying the longer chain 100 percent C_2 position branched alcohols described therein by reducing the C_2 branching to as little as 5 percent and having only mostly lower chain branches.

The inventors herein were honored for this invention at the Southwest Regional Industrial Innovation Awards Program Symposium of the American Chemical Society. The Applicants submit this as evidence of commercial success which rebuts a case of prima facie obviousness. A copy of the announcement is attached hereto as Evidence Appendix D. A copy of the presentation which was given at the Awards Ceremony is also enclosed herewith as Evidence Appendix E. The presentation contains several slides which are relevant to the question of whether or not the differences between the alcohols of the reference and the presently claimed alcohols are "significant" in that whatever structural similarity exists between the two sets of alcohols is not sufficient to predict the properties of the presently claimed alcohols from what is known about the alcohols of the reference.

Slide 16 relates to the Krafft temperature of selectively branched alcohol sulfates within the scope of the present claims (the top 3 alcohols in the slide), sulfates of alcohols which have almost all ethyl or methyl branching at the C_2 position (the fifth and sixth alcohols in the slide), and the sulfate of one linear C_{16} alcohol (the last alcohol in the slide). The Krafft temperature is the temperature at which the mixture containing the alcohol sulfates becomes clear and is an indication of solubility. Since cold water detergency is one of the goals of the present invention, it is better when the Krafft temperature is lower. As can be seen, all three of the selectively branched alcohol sulfates of the present invention have considerably lower Krafft temperature

than the sulfates where almost all of the branching is 2-ethyl or 2-methyl (which are most akin to the alcohol sulfates described in the reference). This is another indication that the previously discussed differences in structure between the alcohol of the reference and the presently claimed alcohol do make a significant difference and that the properties of sulfates of the present invention cannot be predicted from the disclosure of the reference.

Slide 17 shows another physical property difference between the branched alcohol sulfates. The calcium tolerance of the branched alcohol sulfates of the present invention is much higher than the calcium tolerance of the 2-ethyl and 2-methyl branched alcohol sulfates. Slide 19 clearly shows that the detergency performance (at 10°C and 150 ppm water hardness) of the branched alcohol sulfates of the present invention is much better than the detergency performance of the 2-ethyl branched alcohol sulfate and the linear alcohol sulfate (more data that supports the nonobviousness of this invention). This data also shows that the structural differences between the two sets of alcohols give different physical properties and that the properties of the sulfates of the present invention cannot be predicted from the disclosure of the reference.

A portion of this data appears in the article "Solution and Performance Properties of New Biodegradable High-Solubility Surfactants" in Tables 8, 9 and 11 wherein branched alcohol sulfates of this invention are referred to as random methyl alcohol sulfates (RMC15, RMC1617, RMC18). This article, which is enclosed herewith as Evidence Appendix F, was published as part of the proceedings of the 5th World Surfactants Congress in 2000.

Another slide on detergency performance of these alcohol sulfates which was not part of the presentation (which is also enclosed herewith as Evidence Appendix G) includes detergency performance data for alcohol sulfates which contain almost 100 percent either 2-hexyl, 2-butyl, 2-ethyl, or 2-methyl branching. Looking at this slide, it can be seen that the C_{15} and $C_{16,17}$ alcohol sulfates have greatly enhanced detergency performance as compared to the branched alcohol sulfates which have almost 100 percent branching at the C_2 position and particularly much better detergency performance than the 2-hexyl and 2-butyl branched alcohol sulfates. The C_{18} selectively branched alcohol sulfate also had better detergency performance than all of the others but the difference is not quite as dramatic. Again, this data shows that the structural

differences between the branched alcohol sulfates result in different physical properties which cannot be predicted.

Very close structural similarity does not exist in this case and very close structural similarity is required for the analysis applied by the Examiner in the present rejections. It is insufficient for the Examiner to rely on broad assertions that the claimed compositions and the compositions of WO '175 generally fall within the same class or are generally related. Therefore, the guidelines associated with very close structural similarity should not be applied to the present claims, and there is no justification for ignoring differences between the present claims and compositions of WO '175. No prima facie case for obviousness has been established.

No Suggestion or Teaching of the Claim Limitations is Shown

No obvious modification of the compositions of WO '175 would result in a composition that satisfies each and every limitation of the present claims. Only major modifications of the compositions of WO '175 could result in a composition characterized by each and every limitation of the present claims. Furthermore, WO '175 contains no suggestion that would lead a person of ordinary skill in the art from the compositions of WO '175 to the compositions characterized by each and every limitation of the present claims. The only way that a person of ordinary skill in the art, beginning with WO '175, would be motivated to arrive at a composition satisfying each and every limitation of the present claims is by using the present claims as a blueprint.

Conclusion

Based upon the above argument, the Applicants request that the Examiner's rejections be overturned upon this appeal.

Respectfully submitted,

DAVID M. SINGLETON, LOUIS KRAVETZ,
and BRENDAN D. MURRAY

By /Donald F. Haas/
Their Attorney, Donald F. Haas
Registration No. 26,177
(713) 241-3356

P. O. Box 2463
Houston, Texas 77252-2463

CLAIMS APPENDIX

1. A biodegradable sulfate composition comprising sulfates of an alkyl branched primary alcohol composition having an average chain length per molecule of from 14 to 19 carbon atoms, wherein said alcohol composition has an average number of branches per molecule of 0.7 to 2.3, less than 0.5 atom % of quaternary carbon atoms, and said branching comprises methyl and ethyl branches and at least 40% of the branches are methyl branches and 5% to 30% of the number of branches are ethyl branches and from 5 to 25% of the number of branches are on the C_2 atoms of the composition.

2. The biodegradable sulfate composition of claim 1, wherein the average number of branches per chain ranges from 1.5 to 2.3.

3. The biodegradable sulfate composition of claim 1, wherein said alcohol composition contains less than 5% linear alcohols.

4. The biodegradable sulfate composition of claim 3, wherein said alcohol composition contains less than 3% linear alcohols.

6. The biodegradable sulfate composition of claim 1, wherein from 10-20% of the number of branches are on the C_2 atoms of the alcohol composition.

7. The biodegradable sulfate composition of claim 1, wherein from 10-50% of the number of branches are on the C_3 atoms of the alcohol composition.

8. The biodegradable sulfate composition of claim 2, wherein from 15-30% of the number of branches are on the C_3 atoms of the alcohol composition.

12. The biodegradable sulfate composition of claim 1 wherein from 10% to 20% of the number of branches are ethyl branches.

70. A branched primary alcohol composition having an average chain length per molecule of from 14 to 19 carbon atoms, an average number of branches per molecule chain ranging from 0.7 to 2.1, said branching comprising methyl and ethyl branches, and less than 0.5 atom % of quaternary carbon atoms, and wherein less than 5% of the alcohol molecules in the composition are linear alcohols and at least 40% of the branches are methyl branches and wherein 5% to 30% of the number of branches are ethyl branches and wherein 5 to 25% of the number of branches are on the C_2 atoms of the alcohol composition.

72. The composition of claim 70, comprising a sulfate of the alcohol composition.

73. The composition of claim 70, comprising an ethoxysulfate of the alcohol composition.

75. The composition of claim 70 having an average number of branches per molecule ranging from 1.3 to 2.1.

77. A biodegradable branched primary alcohol composition having an average chain length per molecule of from 14 to 19 carbon atoms, an average number of branches per molecule of 0.7 to 2.3, said branching comprising methyl and ethyl branches, and wherein from 5-25% of the branching is at the C_2 position relative to the hydroxyl carbon atom, and from 10% to 50% of the branches are located at the C_3 position and at least 40% of the branches are methyl branches and from 5% to 30% of the number of branches are ethyl branches, said composition having less than 0.5 atom % of quaternary carbon atoms.

79. The composition of claim 77, having an average number of branches ranging from 0.7 to 2.1.

81. The composition of claim 77, wherein less than 5% of the alcohol molecules are linear.

82. The composition of claim 77, comprising a sulfate of the composition.

83. The composition of claim 77, comprising an ethoxysulfate of the composition.

84. The biodegradable sulfate composition of claim 1 wherein said alcohol composition contains branching at the C_2 and C_3 carbon positions.

85. A biodegradable sulfate composition comprising sulfates of an alkyl branched primary alcohol composition having an average chain length per molecule of from 14 to 17 carbon atoms, wherein said alcohol composition has an average number of branches per molecule of 0.7 to 2.3, less than 0.5 atom % of quaternary carbon atoms, and said branching comprises methyl and ethyl branches and 5% to 25% of the number of branches are on the C_2 atoms of the alcohol composition and at least 40% of the branches are methyl branches and from 5% to 30% of the number of branches are ethyl branches.

86. The biodegradable sulfate composition of claim 85 wherein said alcohol composition contains less than 5% of linear alcohols.

87. The biodegradable sulfate composition of claim 86 wherein said alcohol composition contains less than 3% linear alcohols.

88. The biodegradable sulfate composition of claim 85 wherein from 10 to 50% of the number of branches are on the C_3 atoms of the alcohol composition.

89. The biodegradable sulfate composition of claim 88 wherein from 15 to 30% of the number of branches are on the C_3 atoms of the alcohol composition.

92. The biodegradable sulfate composition of claim 85 wherein said alcohol composition contains at least 5% of isopropyl terminal type of branching.

93. The biodegradable sulfate composition of claim 85 wherein said alcohol composition is obtained by skeletally isomerizing olefins under skeletal isomerization conditions.

94. A branched primary alcohol composition having an average chain length per molecule of from 14 to 17 carbon atoms, an average number of branches per molecule of 0.7 to 2.3, less than 0.5 atom % of quaternary carbon atoms, and said branching comprises methyl and ethyl branches and 5% to 25% of the number of branches are on the C_2 atoms of the alcohol composition and at least 40% of the branches are methyl branches and 5% to 30% of the number of branches are ethyl branches.

95. The alcohol composition of claim 94 wherein said alcohol composition contains less than 5% of linear alcohols.

96. The alcohol composition of claim 95 wherein said alcohol composition contains less than 3% linear alcohols.

97. The alcohol composition of claim 94 wherein from 10 to 50% of the number of branches are on the C_3 atoms of the alcohol composition.

98. The alcohol composition of claim 97 wherein from 15 to 30% of the number of branches are on the C_3 atoms of the alcohol composition.

101. The alcohol composition of claim 94 wherein said alcohol composition contains at least 5% of isopropyl terminal type of branching.

102. The alcohol composition of claim 94 wherein said alcohol composition is obtained by skeletally isomerizing olefins under skeletal isomerization conditions.

103. The biodegradable sulfate composition of claim 1 wherein the average number of branches per chain ranges from 0.7 to 2.1.

104. The biodegradable sulfate composition of claim 1 wherein the average chain length per molecule is from 14 to 17 carbon atoms.

105. The branched primary alcohol composition of claim 70 wherein the average chain length per molecule is from 14 to 17 carbon atoms.

106. The biodegradable branched primary alcohol composition of claim 77 wherein the average chain length per molecule is from 14 to 17 carbon atoms.

107. The biodegradable branched primary alcohol composition of claim 77 wherein the average number of branches is from 0.7 to 2.1.

108. The biodegradable sulfate composition of claim 85 wherein the average number of branches per molecule is from 0.7 to 2.1.

109. The branched primary alcohol composition of claim 94 wherein the average number of branches per molecule is 0.7 to 2.1.

EVIDENCE APPENDIX

APPENDIX A

Second Rule 132 Declaration

APPENDIX B

First Rule 132 Declaration

APPENDIX C

Report of Additional Experiments Submitted to the PCT Examiner in 1998

APPENDIX D

Announcement of the Southwest Regional Industrial Innovation Awards Program Symposium of the American Chemical Society Honoring the Present Inventors

APPENDIX E

American Chemical Society Awards Ceremony Presentation

APPENDIX F

"Solution and Performance Properties of New Biodegradable High-Solubility Surfactants," Fifth World Surfactants Conference, 2000

APPENDIX G

Slide on Detergency Performance of Alcohol Sulfates

RELATED PROCEEDINGS APPENDIX

There are no related proceedings.